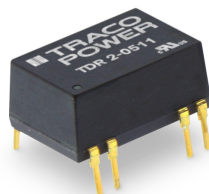




THE DATASHEET OF TDR 2-2411SM

- Compact design in THD Package
- Wide 2:1 input voltage range
- Fully regulated outputs
- Low ripple and noise
- Temperature range -40°C to $+85^{\circ}\text{C}$ without derating
- I/O isolation 1600 VDC
- Continuous short-circuit protection
- Remote On/Off control
- Fully RoHS compliant
- 3-year product warranty



The TDR 2 series is a family of compact 2 W DC/DC-converters with 2:1 input voltage ranges and tightly regulated output voltages even under no load conditions. The product is available in THD-package. They work with high efficiency over the full load range and come with a remote On/Off input. The usability in temperature ranges of up to 85°C without power derating, continuous short circuit protection and excellent immunity against environmental influences make these converters very reliable. A TDR 2 converter is the ideal solution for space critical high end applications in communication equipment, instrumentation and industrial electronics.

Models						
Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	
TDR 2-0511	4.5 - 9 VDC (5 VDC nom.)	5 VDC	400 mA			80 %
TDR 2-0512		12 VDC	167 mA			81 %
TDR 2-0513		15 VDC	134 mA			83 %
TDR 2-0522		+12 VDC	83 mA	-12 VDC	83 mA	81 %
TDR 2-0523		+15 VDC	67 mA	-15 VDC	67 mA	82 %
TDR 2-1211	9 - 18 VDC (12 VDC nom.)	5 VDC	400 mA			81 %
TDR 2-1212		12 VDC	167 mA			81 %
TDR 2-1213		15 VDC	134 mA			84 %
TDR 2-1222		+12 VDC	83 mA	-12 VDC	83 mA	83 %
TDR 2-1223		+15 VDC	67 mA	-15 VDC	67 mA	82 %
TDR 2-2411	18 - 36 VDC (24 VDC nom.)	5 VDC	400 mA			81 %
TDR 2-2412		12 VDC	167 mA			84 %
TDR 2-2413		15 VDC	134 mA			84 %
TDR 2-2422		+12 VDC	83 mA	-12 VDC	83 mA	84 %
TDR 2-2423		+15 VDC	67 mA	-15 VDC	67 mA	84 %
TDR 2-4811	36 - 75 VDC (48 VDC nom.)	5 VDC	400 mA			81 %
TDR 2-4812		12 VDC	167 mA			82 %
TDR 2-4813		15 VDC	134 mA			82 %
TDR 2-4822		+12 VDC	83 mA	-12 VDC	83 mA	83 %
TDR 2-4823		+15 VDC	67 mA	-15 VDC	67 mA	83 %

Input Specifications

Input Current	- At no load	5 Vin models: 40 mA typ. 12 Vin models: 20 mA typ. 24 Vin models: 10 mA typ. 48 Vin models: 7 mA typ.
	- At full load	5 Vin models: 520 mA max. 12 Vin models: 215 mA max. 24 Vin models: 105 mA max. 48 Vin models: 55 mA max.
Surge Voltage		5 Vin models: 15 VDC max. (1 s max.) 12 Vin models: 25 VDC max. (1 s max.) 24 Vin models: 50 VDC max. (1 s max.) 48 Vin models: 100 VDC max. (1 s max.)
Reflected Ripple Current		5 Vin models: 80 mAp-p typ. 12 Vin models: 40 mAp-p typ. 24 Vin models: 30 mAp-p typ. 48 Vin models: 20 mAp-p typ.
Recommended Input Fuse		5 Vin models: 2'000 mA (slow blow) 12 Vin models: 1'500 mA (slow blow) 24 Vin models: 1'000 mA (slow blow) 48 Vin models: 1'000 mA (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Capacitor

Output Specifications

Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models: 0.2% max. dual output models: 0.2% max.
	- Load Variation (0 - 100%)	single output models: 1% max. dual output models: 1% max. (Output 1) 1% max. (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models: 5% max.
Ripple and Noise	- 20 MHz Bandwidth	30 mVp-p typ.
Capacitive Load	- single output	5 Vout models: 1'680 µF max. 12 Vout models: 820 µF max. 15 Vout models: 680 µF max.
	- dual output	12 / -12 Vout models: 470 / 470 µF max. 15 / -15 Vout models: 330 / 330 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Start-up Time		5 ms typ.
Short Circuit Protection		Continuous, Automatic recovery
Transient Response	- Response Time	250 µs typ. (25% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	www.tracopower.com/overview/tdr2
Pollution Degree		PD 2

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55032 class A (with external filter)
	- Radiated Emissions	EN 55032 class B (with external filter)
External filter proposal:		www.tracopower.com/overview/tdr2
EMS Immunity	- Electrostatic Discharge	Air: EN 61000-4-2, ± 8 kV, perf. criteria A
		Contact: EN 61000-4-2, ± 6 kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, ± 2 kV, perf. criteria A
		EN 61000-4-5, ± 1 kV, perf. criteria A
		Ext. input component: KY 220 μ F / 100 V
	- Conducted RF Disturbances	EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous: EN 61000-4-8, 100 A/m, perf. criteria A
		1 s: EN 61000-4-8, 1000 A/m, perf. criteria A

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +85°C (without derating)
	- Case Temperature	+100°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	6.67 %/K above 85°C
See application note:		www.tracopower.com/overview/tdr2
Cooling System		Natural convection (20 LFM)
Remote Control	- Current Controlled Remote (passive = on)	On: open circuit
		Off: 2 to 4 mA current (internal 1 k Ω resistor)
External circuit proposal:		www.tracopower.com/info/current-remote.pdf
	- Off Idle Input Current	Refers to 'Remote' and '-Vin' Pin 2.5 mA max.
Altitude During Operation		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		100 - 1300 kHz (RCC)
Insulation System		Basic Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'600 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M Ω min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	50 pF max.
Reliability	- Calculated MTBF	7'100'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	MIL-STD-810F
	- Thermal Shock	MIL-STD-810F
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (40 - 120 μ m)
Pin Surface Plating		Gold (25 - 75 nm), matte
Housing Type		Overmold
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		DIP14
Soldering Profile		Lead-Free Wave Soldering
		265°C / 10 s max.
Weight		4.5 g

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Environmental Compliance - REACH Declaration

www.tracopower.com/info/reach-declaration.pdf

- RoHS Declaration

REACH SVHC list compliant

REACH Annex XVII compliant

www.tracopower.com/info/rohs-declaration.pdf

Exemptions: 7a, 7c-I

(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)

- SCIP Reference Number

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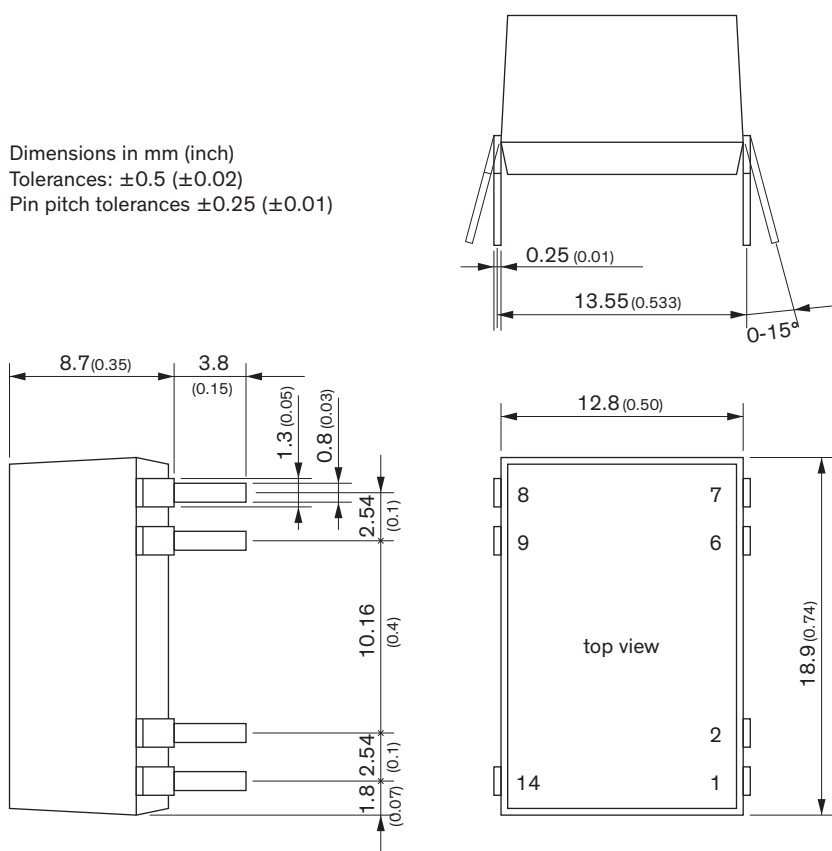
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tdr2

Outline Dimensions

Dimensions in mm (inch)
Tolerances: ± 0.5 (± 0.02)
Pin pitch tolerances ± 0.25 (± 0.01)



Pinout		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
2	Remote On/Off	Remote On/Off
6	NC	Common
7	NC	-Vout
8	+Vout	+Vout
9	-Vout	Common
14	+Vin (Vcc)	+Vin (Vcc)

NC: Not connected

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-  Cost Control Management
-  Shortage Management
-  Alternative Solution
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